CHAPTER 1

Overview

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Introduction

With the exception of skin cancer, prostate cancer is the most commonly diagnosed cancer in the United States and is the second most lethal cancer among men. Approximately 186,320 new cases are estimated to be diagnosed in 2008, and the disease accounts for roughly 10% of cancer-related deaths in men. The lifetime risk of developing prostate cancer is one out of six, and nearly 30,000 men die yearly from this disease (American Cancer Society [ACS], 2008; Jemal et al., 2008). These statistics reinforce the ongoing need for further research into all aspects of the disease, including successful treatment outcomes. Multidisciplinary collaboration among urology, radiation oncology, medical oncology, and nursing is imperative, as attempts to improve outcomes and quality of life persist. In addition to multidisciplinary collaboration, funding for prostate cancer research and patient support is paramount in the progress toward cure.

The National Cancer Institute (NCI) estimated that $309 million in 2006 and $305.6 million in 2007 were spent on prostate cancer research. In contrast, proposed funding for breast, colorectal, and lung cancer research was $551.1 million, $249.1 million, and $261.9 million, respectively (NCI, 2006). An additional estimate for the annual cost of prostate cancer treatment is approximately $8 billion (NCI, 2007). Despite significant expenditure of resources, prostate cancer remains the second leading cause of cancer death among men, behind only lung cancer (Jemal et al., 2008).

Numerous organizations aim to increase awareness of prostate cancer and advocate for increased federal spending. These organizations serve as portals of information and provide support for patients, caregivers, laypersons, and professional healthcare providers. The mission of the National Prostate Cancer Coalition (2005) is to rapidly reduce the burden of prostate cancer on American men and their families through awareness, outreach, and advocacy. The Prostate Cancer Foundation (n.d.), the world's largest philanthropic source of support for prostate cancer research, focuses on improving treatments and finding a cure for recurrent prostate cancer. A number of other nonprofit prostate cancer groups exist, including the American Cancer Society, the Prostate Cancer Education Council, Us TOO International Prostate Cancer Education and Support Network, and the Prostate Cancer Research Institute. All of these groups offer a wealth of information on prostate cancer awareness as well as ongoing financial and emotional support to those afflicted with the disease. The alliance among various nonprofit organizations, advocacy groups, and professional medical societies continues to advance the knowledge and treatment of prostate cancer, along with dissemination of vital information.

A number of professional medical organizations also are keenly interested in and support the fight against prostate cancer. The annual Prostate Cancer Symposium is a collaborative effort of the American Society of Clinical Oncology, the American Society for Therapeutic Radiology and Oncology, the Society of Urologic Oncology, and the Prostate Cancer Foundation. The annual meetings cover numerous topics, including updates on epidemiology, risk factors, prevention, screening and diagnosis, and treatment, including novel treatment approaches. The research and abstracts presented at these meetings illustrate the significant challenge in fully understanding and treating prostate cancer.

Epidemiology

Cancer epidemiology is the study of cancer patterns in populations and cancer causation. Through epidemiologic studies, a greater understanding of changing patterns of cancer incidence and mortality, risk factors, prevention strategies, and the role of genetic variation in cancer etiology has been gained (Tucker, 2001). The epidemiology of prostate cancer has been notoriously difficult to study, making the disease a formidable challenge to practitioners and epidemiologists (Boyle, Severi, & Giles, 2003). The disease is prevalent and has considerable morbidity and mortality, yet the etiology

remains elusive. Advancing age, race, and family history are the only definitive risk factors, although genetic variables also have been suggested to comprise more than 40% of risk factors (Hsing & Chokkalingam, 2006). Men with a first-degree relative diagnosed with prostate cancer have a twofold greater risk of developing prostate cancer compared to men without a family history of the disease (ACS, 2007). African American men clearly have higher incidence and mortality rates for prostate cancer. In addition, African American men often present with a higher stage of cancer and, as a result, die at a younger age from the disease (Jayadevappa, Chhatre, Weiner, Bloom, & Malkowicz, 2005). Some theorized risk factors include androgenic hormones, diet, chronic inflammation, and vitamin D, all of which are currently under study (Hsing & Chokkalingam). The Cohort Consortium is a collaborative effort with multiple study groups evaluating large numbers of individuals with prostate cancer. Launched in 2003, the consortium's primary intent is to evaluate genetic influences and their association with prostate cancer (NCI, 2008).

The Surveillance, Epidemiology, and End Results (SEER) Program of NCI collects and maintains the most comprehensive information regarding the epidemiology of prostate cancer. The SEER database (http://seer.cancer.gov) is the largest database in the United States and Europe. The SEER program, established in 1973 as part of NCI, collects cancer incidence, treatment, and survival data, which are used to monitor the impact of cancer on the U.S. population. Eleven SEER geographic areas maintain population-based cancer reporting systems, including the states of Connecticut, Hawaii, Iowa, New Mexico, and Utah and the metropolitan areas of Atlanta, Detroit, Los Angeles, San Francisco-Oakland, San Jose-Monterey, and Seattle-Puget Sound. These regions cover approximately 14% of the total U.S. population and were selected to provide information from diverse population subgroups, such as racial and ethnic groups and urban and rural residents (Stanford et al., 1999).

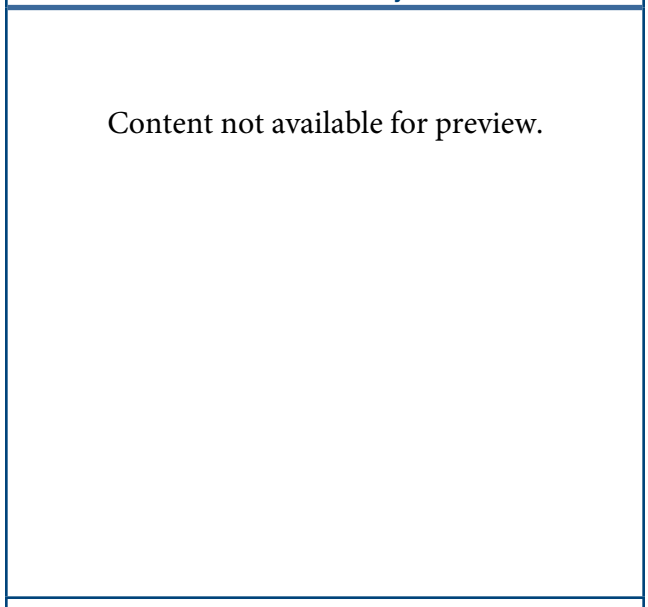
Additional information regarding epidemiology as it relates to incidence and mortality of prostate cancer can be found in Chapter 2.

Anatomy and Physiology

The term *prostate* was originally derived from the Greek word *prohistani*, meaning "to stand in front of," and has been attributed to Herophilus of Alexandria, who used the term in 335 BC to describe the organ located in front of the urinary bladder. Although previously described, detailed anatomic depictions of the prostate gland did not appear until the Renaissance period of world history (AD 1400–1600) (Kirby, Christmas, & Brawer, 2001).

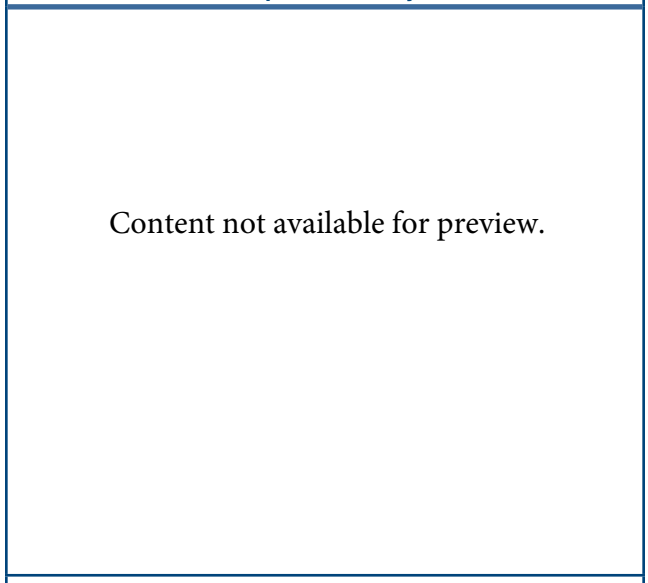
The prostate is a firm, partly glandular and partly muscular structure located within the lower pelvis immediately below the internal urethral orifice and around the beginning of the urethra (see Figures 1-1 and 1-2). Essentially shaped like a walnut, the gland is situated below the inferior part of the pubic symphysis, above the deep layer of the urogenital diaphragm and in front of the rectum, through which it may

Figure 1-1. Anterior View of the Prostate Located at the Base of the Urinary Bladder



Note. Illustration created by Terese Winslow; used courtesy of the National Cancer Institute.

Figure 1-2. Sagittal View of the Male Reproductive System

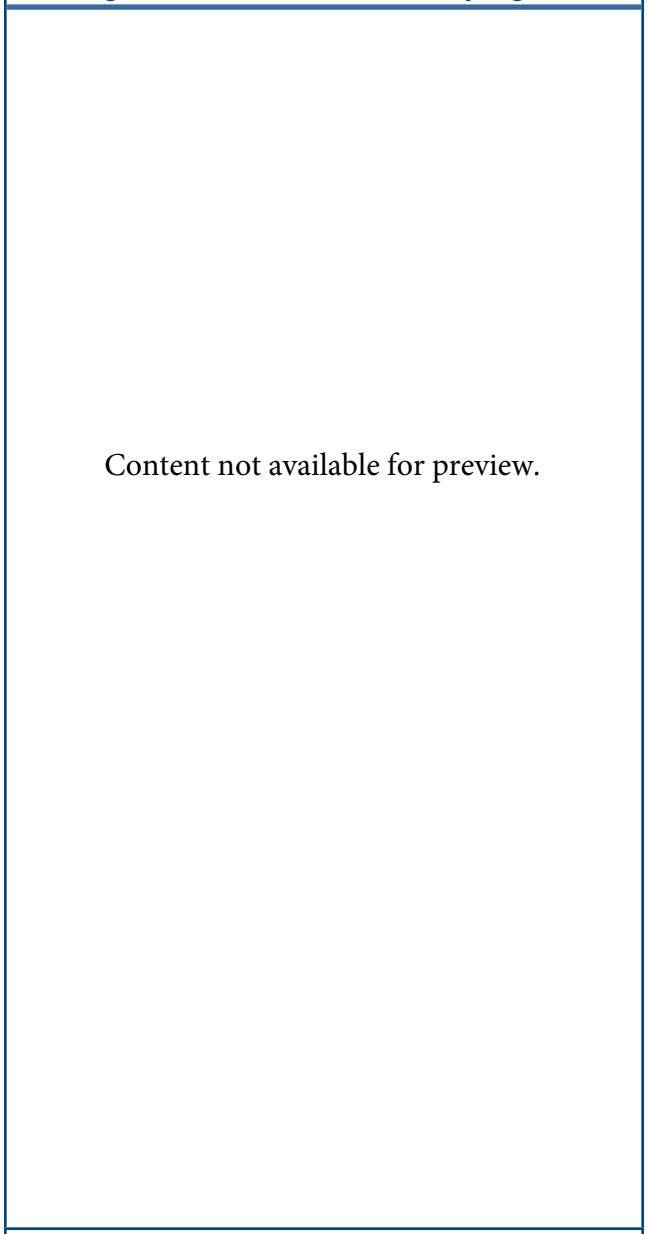


Note. Illustration created by Terese Winslow; used courtesy of the National Cancer Institute.

be palpated, especially when enlarged (Gray, 1985). Palpation of the prostate gland is included as part of a digital rectal examination (DRE) and is considered an essential component of screening for prostate cancer. Because of its anatomic location, DRE is useful in detecting palpable abnormalities in the posterior and lateral aspects of the prostate gland (see inset of Figure 1-3).

The anatomic size of a normal, nonmalignant prostate gland is 28–47 cubic centimeters and is dependent on age (Bosch, Tilling, Bohnen, Bangma, & Donovan, 2007). The prostate, seminal vesicles, and bulbourethral glands (glands of Cowper) constitute the accessory glands of reproduction. The primary function of the prostate is to secrete seminal fluids that act as a medium for spermatozoa during ejaculation. The prostatic secretion constitutes the first and major portion of the ejaculate, with the seminal vesicle contributing a small terminal amount.

Figure 1-3. The Prostate and Nearby Organs



Note. Illustrations created by Alan Hoofring; used courtesy of the National Cancer Institute.

The prostate gland consists of four anatomic zones: the peripheral, central, transition, and fibromuscular zones. The peripheral zone in the normal gland comprises about 75% of the entire prostate. This zone stretches from the apex to the base and covers the bottom and wraps around the sides of the gland. The next largest zone is the central zone, which constitutes the majority of the prostate base. The ejaculatory ducts are located within the central zone space. The transition zone, comprising 5%–10% of the gland in young men, is divided into two separate lobules on either side of the prostatic urethra. The outermost zone, the anterior fibromuscular zone, consists mostly of smooth muscle (Applewhite, Matlaga, McCullough, & Hall, 2001). In regard to general prostate disease, the development of benign prostatic hypertrophy (BPH) typically occurs in the transition zone, whereas 75% of malignant disease develops in the peripheral zone but may invade all three zones (Applewhite et al.). Prostate cancer within the transition zone often can be felt by DRE as a nodular or indurated presentation (Carroll, Lee, Fuks, & Kantoff, 2001).

A capsule or membrane surrounds the prostate, simply called the prostatic capsule. Outside the capsule lies a fascial sheath, which contains nerves and lymphatics, and the prostatic plexus. The neurovascular bundles responsible for producing an erection are located outside of Denonvillier's fascia, which is the rectovesical septum. Increased understanding of the fascia and neurovascular bundles has led to a change in the conventional approach to surgical excision of the gland. Refined surgical techniques now allow for the nerve bundles to remain intact, thus reducing postoperative impotence (Reiter & deKernion, 2002). Additional information about surgical treatment for prostate cancer, including a nerve-sparing approach, can be found in Chapter 4.

Screening for Prostate Cancer

Aggressive prostate-specific antigen (PSA) screening programs over the past few years have resulted in increased detection of early-stage cancers and a decreased number of patients presenting with metastatic disease, and possibly have reduced prostate cancer–related mortality (Ekman, Adolfsson, & Gronberg, 1999; Tarone, Chu, & Brawley, 2000). Approximately 75% of men older than age 50 have participated in prostate cancer screening in the United States (Sirovich, Schwartz, & Woloshin, 2003). Common prostate cancers generally are slow growing, but some can be biologically aggressive. The lifetime risk of a prostate cancer diagnosis in males is 18%,

whereas the lifetime risk of dying from prostate cancer is approximately 3% (Kramer & Siroky, 2004; Thompson & Ankerst, 2007). Given the prevalence of clinically insignificant prostate cancers, reducing the costs and morbidity related to overdetection, diagnostic procedures for benign disease, and overtreatment is important to consider.

ACS (2007) recommends annual DRE and PSA screening in men older than age 50 who have a life expectancy of at least 10 years. Screening for men at higher risk for prostate cancer (African Americans or those with a first-degree relative with a prostate cancer diagnosis before age 65) should be offered at 45 years of age. Prostate cancer screening programs continue to expand in the United States although controversy about the benefits of population screening still persist and a strong consensus regarding appropriate screening practice cannot be agreed upon. Lack of strong supporting evidence has led other countries, such as Canada and the United Kingdom, to forgo recommendations for systematic screening programs (Templeton, 2007; Thompson & Ankerst, 2007; Turner, 2007). Although evidence has shown increased numbers of early prostate cancers diagnosed in populations with broad-based screening programs, the clinical significance of these cancers is unclear, and systematic reviews have failed to identify a mortality benefit related to PSA screening (Harris & Lohr, 2002; Ilic, O'Connor, Green, & Wilt, 2007).

Presentation of Disease

Early-stage prostate cancer, like other early-stage malignancies, may be present in the absence of significant or noticeable symptoms, which highlights the necessity of ongoing screening for at-risk populations. Serum PSA levels may or may not be elevated in the presence of early disease. However, in the majority of men diagnosed with prostate cancer, a PSA level will exceed the normal range of 0–4 ng/ml. Age- and race-specific PSA values are discussed in greater detail in Chapter 2. DRE also may yield little beneficial information as to the presence of early disease, as only a portion of the gland is palpable by even the most experienced clinician.

Upon confirmation of prostate cancer and retrospective consideration, the patient may acknowledge that some symptoms such as frequency, urgency, and nocturia have been present but that he viewed them as simply bothersome and did not mention. As prostate cancer progresses beyond the early stage, urinary symptoms such as decreased stream, increased frequency, and difficulty starting or maintaining stream may develop. However, these same symptoms are present with BPH. Some men may present with hematuria, hematospermia, infection, or varying degrees of impotence. In advanced disease, patients may present with bowel or bladder incontinence, motor weakness, peripheral neuropathy, leg edema, or varying degrees of bone pain. Although treatment modalities vary, the stage of disease upon presentation significantly influences the overall course of treatment. See Chapter 4 for an in-depth examination of treatment options for prostate cancer.

Patterns of Metastasis and Progression of Disease

Most prostate cancers are considered to be very treatable, and in the absence of metastatic disease, cure is possible (Schlomm, Erbersdobler, Mirlacher, & Sauter, 2007). However, even in the presence of metastatic disease, prostate cancer may be controlled for extended periods of time. Mean survival with metastatic disease has been reported as 3–3.5 years, with 4–6-year survival expectations for those with minimal metastatic disease burden (Ekman et al., 1999). Historically, hormonal agents and chemotherapy are used most often in patients with metastatic disease to preserve quality of life and prolong survival (Petrylak et al., 2004).

Dominant theories for the process of metastatic disease in prostate cancer include the *mechanical theory* and *seed-and-soil theory*. The mechanical theory describes direct extension of tumor and spread through the regional lymphatic system into the lumbar spine. The seed-and-soil theory proposes the presence of specific factors that contribute to preferential growth in certain tissues (including the bone, lung, liver, and adrenals). Therefore, while cancer cells may widely disseminate throughout the body, preferential growth in bone may occur because of tissue-specific environmental characteristics that create a favorable condition for growth.

Local/regional disease control appears to decrease the risk of dissemination and metastasis. Biochemical recurrence (increasing PSA level) following surgery or definitive radiation therapy may represent biochemical recurrence only or local/regional recurrence in the prostate or prostate bed. Radiographic imaging often is obtained but may be of limited utility in defining actual disease involvement in this setting. Although up to one-third of patients with biochemical recurrence after prostatectomy may have distant disease, the likelihood of a positive bone scan if the PSA level is less than 7 ng/ml is low and therefore not warranted unless bone symptoms are present (Han et al., 2003). Salvage local therapy (with or without systemic hormonal intervention) often is indicated in this situation to offer greater benefit of local control.

The most frequent sites of metastatic involvement in prostate cancer are the lymph nodes and bone, but liver and lung metastasis also may occur (Gomez, Manoharan, Kim, & Soloway, 2004). Metastatic nodal involvement (occurring outside of the true pelvis) often progresses in a stepwise fashion with local spread to pelvic nodes followed by retroperitoneal and mediastinal adenopathy (Hricak, Choyke, Eberhardt, Leibel, & Scardino, 2007). Patterns of bone metastasis classically demonstrate multiple small, occasionally congruent, metastatic lesions typically involving the axial skeleton

(Buscombe & Hilson, 1999). Bone metastasis from prostate cancer can appear as osteoblastic or osteolytic lesions. These lesions usually can be seen on a plain x-ray film, or correlation with a radionuclide bone scan may be necessary. Bony lesions may or may not be painful, and treatment usually is withheld unless pain is present or an eminent risk of fracture exists, especially to a weight-bearing bone. Solitary metastatic lesions in prostate cancer are less common, but when they occur, they often involve the pelvis or lumbar spine. Late disease often is characterized by involvement of the majority of the axial skeleton and proximal femurs or humeri as well as distant organs such as lung and brain. Generally, this is accompanied by significant increases in serum PSA levels.

Conclusion

Prostate cancer is a relatively common malignancy in the United States that poses significant challenges to public health. As the baby boomer population continues to age, the incidence and prevalence of this disease will increase, further straining the present healthcare system. Prostate cancer is considered a slow-growing disease and may remain indolent for many years prior to diagnosis. Unlike many other primary malignancies, prostate cancer continues to be effectively treated by numerous modalities. Nurses who care for patients with prostate cancer must remain abreast of the multiple treatment options available as well as the morbidity associated with each modality. In addition, nurses should be active in prostate cancer education and early detection programs. Such involvement assists patients, families, and communities in better understanding the benefits and controversies surrounding prostate cancer screening and management.

Subsequent chapters of this text are meant to provide nurses with detailed knowledge regarding the detection, staging, and treatment of prostate cancer. In addition, management of treatment-related side effects, survivorship, and nursing research issues also are explored.

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